

south side of the Pamlico River where cadmium and fluoride concentrations in the sediments were relatively high.

Disease problems have also recently (1988) been reported in oysters. Core and Pamlico Sound oysters were infected by MSX and *Dermosystidium*, both of which are fatal. These pathogens have now spread to oysters in other areas. Toxic dinoflagellate blooms in the fall and winter of 1987 resulted in mortalities of bay scallops.

Definitive causal relationships between diseases and sores and environmental factors have not been established, but declining water quality has been implicated. It is evident that finfish and shellfish are exposed to abnormal stresses in certain areas.

### **C. 3. Anoxia-Related Fish Kills**

There are no systematic data regarding fish and benthos kills in North Carolina's estuaries, although most fish kills have been attributed to low concentrations of dissolved oxygen. In most cases, measurements of dissolved oxygen have been made after a kill is reported so that precise determination of circumstances at the time of a kill is difficult. Commissioning of the Pamlico Environmental Response Team (PERT) may help close the time gap between reporting and investigation of fish kills and may, thereby, generate more pertinent information. Comparisons among 23 estuaries in North Carolina, South Carolina, and Georgia, indicate that the Pamlico is not unique nor are there prolonged periods of impact. Lack of long-term data for these systems makes it impossible to determine exactly how much impact cultural eutrophication has had on the dissolved oxygen conditions.

Bottom water dissolved oxygen concentration is controlled primarily by climatic and hydrologic factors in the Pamlico River Estuary, the only area where studies have been conducted. There has been no trend toward lower dissolved oxygen concentrations over the past 17 years of record. Low bottom water dissolved oxygen (hypoxia) does not occur in the estuary when water temperatures are lower than about 20°C. Above 20°C, dissolved oxygen values of less than 1 mg/liter were found in about 20% of the samples from the upper estuary, but in only 4% of the samples from the lower estuary. Salinity stratification prevents mixing of the bottom water with surface water, which prevents aeration of the bottom water, leading to anoxia. Anoxia can become established in a short period of time during summer; and, conversely, can be dissipated very quickly if mixing occurs.

While widespread sediment contamination is not apparent, several "hotspots" of elevated concentrations of heavy metals have been identified within the study area; most are believed to be associated with known point source dischargers. Anoxic and other adverse water quality episodes were probably as common in past decades, as they are today. However, long-term data upon which to base arguments regarding changes and trends in sediment characteristics and subsequent water quality or biological impacts simply are not yet available. The precise relationship between pollutant loading and pollutant concentrations in sediments is unknown since the role of nutrient recycling has not been quantified.

### **C. 4. Changes in Distribution Patterns of Benthic Organisms**

Beds of submerged aquatic vegetation (SAV) occupy the shallow waters immediately behind the barrier islands (seagrass meadows) and some of the tributaries along the mainland side of the Albemarle-Pamlico estuarine system. Distribution of the SAV varies greatly in space and through time. Near the inlets, and in higher salinity water, the SAV is composed largely of eelgrass and Cuban shoalgrass. In waters of somewhat lower salinity, widgeongrass may predominate; and in slightly brackish or fresh water areas, wild celery, Eurasian watermilfoil, or a mixture of pondweeds and related species may occur.